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DIVISION 15 - MECHANICAL

SECTION 15810J

CLEANING OF COMMERCIAL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

02/05

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SECTION 15810J

CLEANING OF COMMERCIAL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS
02/05

****
NOTE: This guide specification covers the requirements for cleaning of HVAC systems.
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PART 1 GENERAL

1.1 REFERENCES

The following current standards and publications of the issues currently in effect form a part of this specification to the extent indicated by any reference thereto:

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 62	(1989) Ventilation for Acceptable Indoor Air Quality

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA	(1991) Building Air Quality

NATIONAL AIR DUCT CLEANERS ASSOCIATION (NADCA)

NADCA	(1995) Introduction to HVAC System Cleaning Services; Understanding Microbial Contamination in HVAC Systems

NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION (NAIMA)

NAIMA	(1993) Cleaning Fibrous Glass Insulated Air Duct Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA	(1985) HVAC Duct Construction Standards - Metal and Flexible

UNDERWRITER'S LABORATORIES (UL)

UL 181a	(1996; Rev Dec 1998) Factory-Made Air Ducts and Air Connectors

1.2 QUALIFICATION OF THE HVAC SYSTEM CLEANING CONTRACTOR

1.2.1 Membership

The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.

1.2.2 Certification

The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systemsin full compliance with ASHRAE 62.

1.2.3 Supervisor Qualifications

A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.

1.2.4 Experience

The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the **owner**. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.

1.2.5 Equipment, Materials and Labor

The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services and comply with the appliable provisons of ASHRAE 62.

a. The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., contractors should comply with applicable national safety codes and standards.

b. The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification

c. Contractor shall submit to the **owner** all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning process.

1.2.6 Licensing

The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules,

regulations, and licensing requirements.

1.3 STANDARDS

1.3.1 NADCA Standards

The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCAA).

a. All terms in this specification shall have their meaning defined as stated in the NADCA Standards.

b. NADCA Standards must be followed with no modifications or deviations being allowed.

1.4 DOCUMENTS

1.4.1 Mechanical Drawings

The **owner** shall provide the HVAC system cleaning contractor with one copy of the following documents:

a. Project drawings and specifications

b. Approved construction revisions pertaining to the HVAC system

c. Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

3.1 SCOPE OF WORK

3.1.1 Scope

This section defines the ***minimum*** requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.

The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.

The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts (except ceiling plenums and mechanical room) to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up

air systems.

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Note: Users of this specification must modify the above paragraph to succinctly and specifically define those systems and components requiring cleaning.
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3.2 HVAC SYSTEM INSPECTIONS AND SITE PREPARATIONS

3.2.1 HVAC System Evaluation

Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this project.

Damaged system components found during the inspection shall be documented and brought to the attention of the **owner**.

3.2.2 Site Evaluation and Preparations

Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.

3.3 GENERAL HVAC SYSTEM CLEANING REQUIREMENTS

3.3.1 Containment

Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.

3.3.2 Particulate Collection

Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.

3.3.3 Controlling Odors

All reasonable measures shall be taken to control offensive odors and/or mist vapors during the cleaning process.

3.3.4 Component Cleaning

Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

3.3.5 Air-Volume Control Devices

Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

3.3.6 Service Openings

The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.

Contractor shall utilize the existing service openings already installed in the HVAC system where possible.

Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.

Closures must not significantly hinder, restrict, or alter the air-flow within the system.

Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.

Openings must not compromise the structural integrity of the system.

Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.

Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.

Rigid fiber glass ductboard duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques which comply with UL 181 or UL 181a are suitable for fiber glass duct system closures.

All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the **owner** in project report documents.

3.3.7 Ceiling Sections (Tile)

The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.

3.3.8 Air Distribution Devices (Registers, Grilles and Diffusers)

The contractor shall clean all air distribution devices.

3.3.9 Air Handling Units, Terminal Units, Blowers and Exhaust Fans

The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with

NADCA Standards. Contractor shall:

a. Clean all air hadling unit (AHU) internal surfaces, components and condensate collectors and drains.

b. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.

c. Clean all coils and related components, including evaporator fins.

3.3.10 Duct Systems

Contractor shall:

a. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.

b. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Testings (see NADCA Standards).

3.4 HEALTH AND SAFETY

3.4.1 Safety Standards

Cleaning contractors shall comply with all applicable federal, state, and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.

3.4.2 Occupant Safety

No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.

3.4.3 Disposal of Debris

All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

3.5 MECHANICAL CLEANING METHODOLOGY

3.5.1 Source Removal Cleaning Methods

The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods which will render the HVAC system Visibly Clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient

power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment is assured.

All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.

All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.

All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

3.5.2 Methods of Cleaning Fibrous Glass Insulated Components

Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests (see NADCA Standards).

3.5.3 Damaged Fibrous Glass Material

If there is any evidence of damage, deterioration, delamination, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.

When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.

3.5.4 Replacement Material

In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.

Replacement of damaged insulation is **not** covered by this specification.

3.5.5 Cleaning of Coils

Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be

operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

3.5.6 Biocidal Agents and Coatings

Biocidal agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.

Application of any biocidal agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.

Only biocidal agents registered by the U.S. Environmental Protection Agency (EPA) specifically for use within HVAC system shall be used.

Biocidal agents shall be applied in strict accordance with manufacturer's instructions.

Biocidal coating products for both porous and non-porous surfaces shall be EPA registered, water soluble solutions with supporting efficacy data and MSDS records.

Biocidal coatings shall be applied according to manufacturer's instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces. A continuous film must be achieved on the surface to be treated by the coating application. Application of any biocidal coatings shall be in strict accordance with manufacturer's minimum millage surface application rate standards for effectiveness.

3.6 CLEANLINESS VERIFICATION

3.6.1 General

Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.

3.6.2 Visual Inspection

the HVAC system shall be inspected visually to ensure that no visible contaminants are present.

If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the **owner** reserves the right to further verify system cleanliness through gravimetric or wipe testing analysis testing as specified herein.

If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

3.6.3 Gravimetric Analysis

At the discretion and expense of the **owner**, sections of the HVAC system may be tested for cleanliness using the NADCA Vacuum Test (gravimetric analysis) as specified in applicable NADCA Standards. Levels of debris collected shall be equal to or less than acceptable levels defined in applicable NADCA Standards.

If gravimetric analysis determines that levels of debris are equal to or lower than those levels specified in applicable NADCA standards, the system shall be considered clean and shall have passed cleanliness verification.

If gravimetric analysis determines that levels of debris exceed those specified in applicable NADCA standards, the system shall not be considered clean and those sections of the system which failed cleanliness verification shall be re-cleaned at the expense of the HVAC system cleaning contractor.

Gravimetric analysis shall be performed by a qualified third party experienced in testing of this nature.

Cleanliness verification shall be performed immediately after mechanical cleaning and before the HVAC system is restored to normal operation.

3.6.4 Verification of Coil Cleaning

Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (see NADCA Standards).

3.7 PRE-EXISTING SYSTEM DAMAGE

Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

3.8 POST-PROJECT REPORT

At the conclusion of the project, the Contractor shall provide a report to the **owner** indicating the following:

a. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.

b. Areas of the system found to be damaged and/or in need of repair.

-- End of Section --